caida

April 27, 1998

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission (FCC)
1919 M Street, NW
Rm. 222
Washington, DC 20554

SUBJECT: Comments by CAIDA Concerning the FCC's Review of
the Acquisition of MCI Communications Corp.
by Worldcom, Inc. -- Docket Number: 97-211

Dear Ms. Salas,

Please find enclosed the comments of the Cooperative Association for Internet Data
Analysis (CAIDA) on the application for transfer of MCI Communications Corporation
to Worldcom, Inc.

We respectfully request that these comments be placed on the public docket. A copy of
the comments are also posted on the CAIDA website at http://www.caida.org/Caida/fcc-
98.html.

If you have any questions, please feel free to contact me at (619)822-0943.

Regards,

Tracie Monk
Director, CAIDA

cc: Michelle Carey, FCC
Dr. k claffy, UCSD/CAIDA

Comments by CAIDA
Concerning the FCC's Review of the
Acquisition of MCI Communications Corp. by
Worldcom, Inc.

The Cooperative Association for Internet Data Analysis (CAIDA) would like to take this opportunity to comment on the quality of the data underlying evaluation of the proposed MCI-Worldcom merger. CAIDA is a collaborative undertaking by industry and government to promote greater cooperation in the engineering and maintenance of a robust, scalable global Internet infrastructure. CAIDA provides a neutral framework for competitors to work together to address current and future operational and engineering requirements of the commercial Internet. CAIDA's current focus is on developing and deploying traffic measurement and analysis tools to support engineering level decision-making and related collaborations.

The views presented below concern the inadequacies of the data upon which the Federal Communications Commission (FCC) is basing its Internet-related decisions and the industry-wide failure to acquire and analyze basic traffic statistics in support of business, operational, and regulatory decisions affecting the Internet. We [CAIDA] are not qualified to reflect on the economic merits or business implications of the proposed merger, and question the ability of any party, including the FCC, to make thoughtful decisions in this matter given the poor quality of the data and analyses associated with the commercial Internet.

The lack of reliable traffic information is ubiquitous in the Internet sector. The absence of detailed engineering-level data directly affects the quality of Internet service providers' operational and capacity decisions, the ability of government to make well-reasoned regulatory and economic decisions, and the ability of Internet hardware and software vendors to develop adequate specifications for future products. The current MCI-Worldcom discussions provide an important opportunity for the FCC, as well as the Internet service providers and suppliers, to take steps to ensure that future decisions will be based on a detailed understanding of the facts and trends underpinning this strategic industry.

DATA SUPPORTING THE MCI-WORLDCOM REVIEW:

With few exceptions, measurement or characterization of traffic within or between networks is minimal today. With networks struggling to meet the burgeoning demands of new customers and additional capacity, few Internet managers place a high priority on gathering or analyzing data on their networks. This attitude is strengthened by the general lack of quality measurement or analysis tools to support these endeavors, and the absence of baseline data against which an analyst can compare any results.

Given this environment, it is little wonder that the market share data cited by the Communications Workers of America (CWA) in its filing dated January 6, 1998 is suspect. According to the CWA, their claims of MCI/Worldcom market dominance are based in large measure on survey data presented in the June 1997 issue of Boardwatch magazine. In this article, Boardwatch suggests that MCI has interconnections with 41% of the U.S. Internet service providers and Worldcom/UUnet with 21% of the ISPs being reviewed. CAIDA questions the methodology

employed by Boardwatch in making its market assertions and the liberties taken by CWA in suggesting that these data are relevant to the current discussions. But as poorly-founded as their conclusions may be, they still represent a legitimate attempt to characterize the Internet marketplace and calibrate the relative positions of its players. Historic or current data about traffic on the Internet infrastructure, or projections about how it is evolving, simply do not exist.

To its credit, the U.S. government has recognized the flaws in the CWA/Boardwatch data, and has taken steps to request additional information directly from MCI-Worldcom and their competitors. Requested information include data on:

- Players in the Market
- Internet Service-Related Revenues Ranking of Peers (based on traffic exchanged)
- Internal Network Traffic
- Physical Capacity (interconnections)
- Active Bandwidth
- Points of Presence
- Route Entries Announce/Advertised
- Relationships with Other Backbone Providers

While these data provide some information on individual networks and specific links, the reality is that the statistics offer limited insights as to a network's role in the overall infrastructure and are not comparable across networks due to differences in measurement methodologies and equipment. This U.S. government query is also unlikely to yield data that can be aggregated. Without an Internet-wide denominator, individual network's responses can not be effectively compared nor can any network's position in this market be determined with any certainty.

The traffic analysis data provided to the U.S. government in response to this inquiry will likely be based largely on aggregate bulk utilization data derived from SNMP router statistics, or possibly from Cisco-specific Netflow data. The SNMP statistics reflect traffic passing through specific network interfaces, e.g., tracking the volume of traffic being routed to or from specific routers or switches. The relevance of these data to issues of market share or market dominance is therefore limited given that packets traverse multiple hops and Autonomous System (AS) paths as they make their way from source host to destination host.

ADDITIONAL (FUTURE) SOURCES OF DATA

Analysis of measurements relating to packet source and destination addresses, such as those available through the passive monitors, such as Coral, can provide insights as to the nature of Internet traffic and assist in making engineering decisions relating to peering and infrastructure investments. Similarly, data on the composition of actual traffic, e.g., by protocol, application, or other metric; and engineering details on traffic behavior, such as inter-arrival times, performance, packet runlengths, or path lengths, etc. contribute to our ability to engineer next generation internetworking equipment and infrastructures.

Analysis of AS data based on information obtained from review of multiple, comprehensive BGP 4.0 route tables can also provide indications as to the richness of an ISP's peering relationships over time. Analysis of AS data from packet traces can provide information as to the actual paths or networks that traffic traverses as it makes its way through the Internet infrastructure at a select point in time. Yet, while these analyses can serve as indicators of traffic behavior and

point in time. Yet, while these analyses can serve as indicators of traffic behavior and relationships among the Internet's providers, they are not exhaustive nor can they be generalized across providers.

Similarly, analysis and visualization of the Internet Protocol (IP) v. 4 address space reflects how current Internet address space is allocated (to institutions and ISPs) and the degree to which allocated space is actually being advertised and routed across the Internet infrastructure. Such depictions of the address space can also provide inputs for analysis of public policy (equity) issues, as well as information for evaluating engineering and operational aspects of the commercial Internet.

Any analysis of the emerging Internet infrastructure should also consider emerging protocols and technologies upon which new services may be based. While services on the current Internet may be relatively homogenous today, differentiation among provider services will accelerate as networks come to terms with the technical, measurement, and billing requirements required for enhanced qualities of service. Such segmentation will ensure that traffic associated with guaranteed or value-added service levels provided by one network will not be directly comparable with "best effort" traffic services provided by another network.

These data (traffic characterization, performance information, routing data, AS and topology data, queue lengths, IPv4 information) can potentially provide valuable information on the Internet and indications of its general health and evolution. With few exceptions, little to no work is underway to gather and analyze these types of data. Meaningful market analyses or engineering studies, or regulatory decisions such as those currently underway within the FCC, should include analyses of these data as fundamental elements of their review. Parties engaged in the current process should also encourage the community, most notably the providers, to proactively gather statistics and, once data is available, the community should encourage efforts to correlate Internet metrics in ways that can truly enhance the depth and breadth of our understanding of this industry.

Sources of background information on Internet Traffic Analysis:

   http://www.caida.org
   http://moat.nlanr.net
   http://www.merit.edu/ipma
   http://www.nlanr.net/INFO

A copy of these comments is also available at http://www.caida.org/Caida/fcc-98.html